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Part III

Department of Labor

Occupational Safety and Health Administration

Occupational Noise Exposure; Hearing Conservation Amendment; Rule and Proposed Rule

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

Occupational Noise Exposure; Hearing Conservation Amendment

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Partial lifting of administrative stay; request for comments; clarification and interpretation of rule; corrections.

SUMMARY: On January 16, 1981 OSHA published an amendment to its occupational noise exposure standard (46 FR 4078) requiring hearing conservation programs for all employees whose noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels (dB). The amendment was to become effective on April 15, 1981, with various provisions being phased in over a two year period. OSHA deferred the effective date of the amendment until August 22, 1981 in order to give the Agency time to evaluate numerous requests for clarification and petitions for administrative stay.

By its action today, OSHA is (1) lifting the administrative stay as to many portions of the amendment, (2) making certain technical corrections, (3) inviting public comment on the continuation of the stay for other provisions, (4) inviting new information and comments on the merits of many provisions in the hearing conservation amendment and (5) clarifying various provisions of the amendment.

DATES: Except for those provisions that continue to be stayed, the amendment is effective August 22, 1981. See Supplementary Information for details. Comments on the continuation of the stay must be received by September 22, 1981. Comments on the provisions which are reopened must be received by November 23, 1981.

ADDRESSES: Written comments should be submitted to the OSHA Docket Office, Docket No. H–011, Room S–6212, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, D.C. 20210, telephone 202–523–7894.

FOR FURTHER INFORMATION CONTACT: Dr. Alice Suter, Office of Physical Agents Standards, Occupational Safety and Health Administration, Room N–3718, U.S. Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210, Telephone (202) 523–7151.

SUPPLEMENTARY INFORMATION:

I. Background

On January 16, 1981 (46 FR 4078) OSHA promulgated an amendment to its occupational noise exposure standard (29 CFR 1910.95 (a) and (b)).[1] The new hearing conservation amendment requires employers to provide an effective hearing conservation program for all employees exposed to an 8 hour TWA of 85 dB.[2] This amendment supplements the existing standard and specifies the essential elements of an effective hearing conservation program. Briefly, the amendment contains requirements for monitoring employee noise exposure, annual audiometric testing for those employees exposed at or above a TWA of 85 dB, the proper selection of hearing protectors such as ear plugs, education and training of employees, warning signs and the keeping of records pertaining to exposure monitoring and audiometric testing.

The amendment covers all employees who work for employers covered by the Act except those engaged in construction or agriculture. OSHA estimated that at least 5.1 million employees in as many as 300,000 establishments have noise exposures above 85 dB and are therefore covered by the amendment. The amendment was estimated to cost approximately $254 million per year [3] or $53 per worker per year.

Employers were given 90 days in which to become familiar with the standard. Various provisions of the standard were to be phased in over a two year period. For example, employers were given 6 months from the effective date of the standard to do initial determinations and to monitor the employee exposures (originally this was to be done by October 15, 1981). Baseline audiograms had to be completed within a year of the effective date of the standard (April 15, 1982) and employers were given an additional year in which to obtain certain equipment such as audiometric test booths and dosimeters meeting the requirements of the standard.

After the amendment was promulgated the Agency received numerous requests for clarifications and interpretations of various provisions of the standard. A number of objections based on misunderstandings of certain portions of the standard or preamble were also received. In addition, there were petitions for administrative stay and a number of requests that the entire amendment be reconsidered pursuant to Executive Order 12291 (46 FR 13193) which was issued on February 17, 1981. Over 250 comments, petitions, and requests for clarification were received and it was necessary for the Agency to defer the effective date of the standard several times (see 46 FR 21365, 4/10/81, 46 FR 28845, 5/29/81 and 46 FR 39137, 7/31/81) in order to evaluate the merits of the numerous petitions and comments. Petitions for judicial review under section 6(f) of the Act have been filed by the Chocolate Manufacturers Association, Chamber of Commerce, American Iron and Steel Institute, Fleck Industries, Inc., and the AFL–CIO.

OSHA has very carefully reviewed and analyzed all of the comments, petitions, and requests for clarifications in light of the lengthy preamble to the amendment and consistent with the requirements of E.O. 12291 to evalute the cost-effectiveness of agency regulations. Based on this review, OSHA has decided that major portions of the amendment which are outlined below should be allowed to go into effect. The underlying rationale for these requirements can be found in the preamble to the January 16, 1981 rule (see 46 FR 4078 *et seq.*), which is hereby reaffirmed for those portions going into effect. A Regulatory Impact Analysis conforming to the requirements of Executive Order 12291 has been prepared and is summarized briefly below. The petitions for administrative stay are therefore denied insofar as they relate to the portions of the amendment which are being put into effect. More detailed reasons for denying these parts of the petitions will be sent to the petitioners shortly. OSHA concludes that the provisions which are going into effect on August 22 constitute a coherent and protective hearing conservation amendment.

Many of the petitions, comments and objections were based on misinterpretations of the meaning and

[1] The existing standard sets a permissible exposure level for noise of 90 dB as an 8 hour time weighted average and requires the employer to reduce employee exposure to within this level by the use of feasible engineering controls or administrative controls. In addition, the existing standard requires that a "continuing effective hearing conservation program" be implemented when employee exposure exceeds 90 dB without regard to the use of hearing protectors, but the standard does not spell out the elements of such a hearing conservation program.

[2] Assuming an exchange rate of 5 dB, a TWA of 85 dB is approximately half a TWA of 90 dB.

[3] The actual cost of the amendment was estimated to be about $270 million per year, but this figure was adjusted to $254 million per year in recognition of the ongoing hearing conservation programs some employers have established. Therefore, the $254 million dollar estimate contained in the Regulatory Analysis represents the amount of new cost that would be incurred by industry as a result of the amendment. This cost has subsequently been recalculated, based on new information, to $234.6 million.

purpose of certain portions of the amendment. Where this was the case, the discussion below provides explanations and clarifications in response to these comments. In addition, in some instances comments pointed out clear errors in the standard. These errors in the standard are also discussed and corrected below.

As to certain other provisions, the Agency is reopening the record for additional comment. Generally, the record has been reopened for substantive comment where there is reason to believe, based on the comments received to date, that there may be a more cost effective way of accomplishing the desired result of saving employee hearing, or where new information as to the feasibility or desirability of a requirement has been submitted which deserves further evaluation.

For most of the provisions on which the record is being reopened, comments are also requested on whether these provisions should continue to be stayed while the public is given an opportunity to submit their substantive comments and these comments are evaluated. A short period of time (30 days) is being given in which to comment on whether these provisions should continue to be stayed. In the meantime, these provisions are stayed. After considering all timely public comments on whether the interim stays should be allowed to remain in effect pending consideration of the substantive comments, the Assistant Secretary will make a decision on the stays which will be published in the **Federal Register.**

This procedure is considered to be the most practical way of resolving the stay matter and to comply with all procedural requirements which may apply. The alternative of allowing these provisions to go into effect for the brief period of time necessary to solicit public comment and then possibly reinstituting the stay would be confusing to employers and employees. In addition such a course of action would not result in any increased employee protection since essentially no action need be completed within the time period given for comments on the stay. Where public comment has been requested as to whether the stay should continue, substantial questions have been raised concerning the extent to which these provisions contribute to occupational safety and health and whether their inclusion in the standard is necessary or appropriate. Therefore, at least until the public comments on the stay can be evaluated, it is inappropriate to allow these provisions to go into effect. Good cause is therefore found for continuing the administrative stay of these provisions whil epublic comments on the stay can be considered.

To assist the public in determining which portions of the standard are in effect and which portions are stayed, a copy of the amendment, with only those portions which are in effect, has been reprinted below.

II. Public Participation

A. Interim Stays

Interested persons are invited to submit written views and arguments as to whether the interim stay of any of the paragraphs discussed below should be allowed to continue pending reconsideration of the substantive requirements contained in these paragraphs. These comments must be submitted in quadruplicate to the Docket Officer, Docket H–011, Room S–6212, Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210 and must be received in the Docket Office no later than September 22, 1981. Comments on the stays should be marked "stay" at the top of the first page. All submissions will be available for public inspection and copying at the above address.

B. Substantive Provisions

Interested persons are requested to submit written data, views and arguments on the provisions that are reopened below. Any hearing requests submitted will be given appropriate consideration. These comments must be submitted in quadruplicate to the Docket Officer, Docket H–011, Room S–6212, Department of Labor, 200 Constitutions Avenue, N.W., Washington, D.C. 20210. These submissions must be received in the Docket Office no later than November 23, 1981. The submissions will be available to the public for inspection and copying at the above address. All timely submissions received, as well as all post-promulgation comments and petitions which have already been submitted to the Agency, will be made part of the record of this proceeding and will be considered by the Assistant Secretary in making any modifications to the hearing conservation amendment.

III. Summary and Explanation of Actions Taken

The material below details and discusses the provisions of the hearing conservation amendment for which the interim stay is continuing. Several non-substantive or technical amendments and corrections are included. Also, specific questions are posed and substantive comments requested on the various provisions on which the record is being reopened. In addition, clarifications and interpretations which are responsive to comments received are given for many of the provisions which are going into effect.

Permissible Exposure Limit

The subject of the permissible exposure limit (PEL) was mentioned frequently in the comments and petitions. Many commenters confused the action level concept with the PEL and interpreted the amendment as lowering the PEL to 85 dB. The amendment does not lower the PEL to 85 dB; the PEL is still 90 dB (see 29 CFR 1910.95 (a) and (b)). The 85–dB TWA referred to in the amendment is an *action level* which triggers the initiation of hearing conservation programs. The issue of the appropriate PEL, including the appropriate exchange rate, will be considered in the near future when 29 CFR 1910.95 (a) and (b) are reviewed. This review will include consideration of the appropriate method of compliance with the permissible exposure level.

Hearing Conservation Program— Paragraph (c).

Paragraph (c) will be corrected by inserting the words "slow response" after "an 8-hour time-weighted average sound level measured on the A scale", in the first sentence. These words were inadvertently left out of the amendment and have been added to conform paragraph (c) with § 1910.95(a) and with the original intention as expressed in the preamble (see 46 FR 4137, 1/16/81).

Exposure Monitoring—Paragraphs (d)–(h).

The hearing conservation amendment required that employers make an initial determination concerning the need for monitoring. If the initial determination was positive, employers were required to measure *personal* noise doses for representative employees using equipment meeting minimum specifications and calibrated to ensure accuracy. This monitoring was required to be conducted at least every two years and within 60 days of a change of process which changed noise exposures to the extent that employees previously exposed below 85 dB would be exposed above 85 dB, or if the change was such that it rendered inadequate the hearing protectors issued.

The Agency received a number of requests to administratively stay and to reconsider the requirements for noise exposure monitoring. Probably the most serious objection came from employers who believed that personal exposure monitoring was unnecessary for

purposes of hearing conservation programs. They stated that area monitoring is sufficient to identify the employees who need to be included in the program, and that area monitoring is simpler and less costly. The adequacy of hearing protector attenuation would be computed from sound levels obtained for the various areas in which employees worked.

Some employers maintained that the requirement for initial determination was unnecessary, and that the specific bases from which a positive determination could result were unnecessarily complicated and might lead to labor-management conflict. Other commenters objected to the requirement that the employee with the highest exposure be selected (if one employee was to represent the others), saying that the effect of such a requirement was to force employers to monitor all employees. In addition, comments objected to the periodic remonitoring requirement, stating that remonitoring every two years was costly and unnecessary, and that remonitoring when there was a change in process or equipment should be sufficient. Objections were raised to requiring employee exposure notification; also to the idea of notifying workers of their measured exposure levels since exposure levels might vary considerably for day-to-day. Moreover, notifying workers of their actual exposure levels would be difficult for employers using area monitoring. Commenters believed that individual notification was unnecessary and that posting a notice of exposure should suffice.

OSHA received many adverse comments on the requirements of paragraph (g), *Method of measurement.* Commenters questioned the accuracy of noise dosimeters, especially in impulsive noise conditions, and objected to setting the dosimeter's lower threshold at 80 dB. Some questioned the technical feasibility of dosimeters meeting the crest factor test specified in the standard. Rather than requiring the ANSI S1.25, Section 7.5 test for measuring a crest factor capability as high as 30 dB, it was suggested that the frequency, duration and repetition of the test signal be stated. Many comments were opposed to the inclusion of Appendix B, *Temporal Sampling Procedures for Use with a Sound Level Meter.* They stated that it was unnecessarily complex and rigorous. The sampling strategy outlined in Appendix B would be unnecessarily stringent if area monitoring procedures were to be used. The requirements for microphone placement would also be incompatible with the concept of area monitoring. The Agency also received comments objecting to the calibration requirements, stating that they were unnecessary.

The many objections to specific noise exposure monitoring requirements have persuaded OSHA to reconsider these provisions and seek further comment on their appropriateness. In the meantime, OSHA will require employers to monitor noise exposure where employees are exposed at or above an 8-hour time-weighted average of 85 dB, and the stay of all of the detailed monitoring requirements published in January will continue. Paragraphs (d) through (h) therefore are being stayed for further comment, with the exception of parts of paragraph (e) and paragraph (g)(2)(ii)(*b*). Thus, the monitoring obligation will consist of two sentences:

(e)(1) When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall obtain measurements for employees who may be exposed at or above that level.

(g)(2)(ii)(*b*) All continuous, intermittent, and impulsive sound levels from 80 dB to 130 dB shall be integrated into the computation.

As it now reads, the requirement for monitoring is a performance requirement. This change allows employers to use an area monitoring or a personal monitoring approach, with whatever measurement procedure they consider appropriate. While monitoring must be completed within 6 months, remonitoring may be done as often or as seldom as employers consider to be warranted by the circumstances. All continuous, intermittent and impulsive sounds between 80 dB and 130 dB must be included in the measurement, although the employer is free to use any instruments or measurement technique that will do this. While the standard which is going into effect does not require the employer to calculate each employee's noise dose, the standard does require all employees exposed at or above a TWA of 85 dB to be included in a hearing conservation program. Therefore, when enforcing the standard, OSHA will inspect to determine whether employers have failed to include in the hearing conservation program all employees whose exposures equal or exceed a TWA of 85 dB.

Comments are requested on whether the interim stay of the monitoring provisions should continue. In addition, in order to evaluate the monitoring provisions, OSHA is requesting comments, information, and data on the following:

1. The need for monitoring to achieve a successful hearing conservation program.
2. The need for an initial determination, to help focus on whether monitoring is necessary, in addition to general monitoring requirements.
3. The advantages and disadvantages of area monitoring or personal exposure monitoring for hearing conservation purposes.
4. Criteria for selecting a representative employee to monitor.
5. The circumstances under which remonitoring is necessary.
6. The need for notifying employees of their actual exposures.
7. The appropriateness of requiring measuring instruments to conform with consensus standards such as ANSI.
8. The ability of sound level meters and dosimeters to measure impulsive, intermittent, and continuous noise accurately, including criteria for determining accuracy.
9. The need for specifying a test for dosimeter crest factor capability, and if so, suggestions as to the content of such a test.
10. The availability and cost of dosimeters with a dynamic range of 80 dB to 130 dB.
11. Appropriate sampling procedures for use with a sound level meter for purposes of area monitoring or personal monitoring, and the need for requiring such procedures.
12. The need for standardized microphone placement for purposes of area monitoring or personal monitoring, and if so, suggestions as to appropriate microphone placement.
13. The need for field and laboratory calibration requirements for noise measuring instruments.
14. The need for requiring specific monitoring practices that employees must be allowed to observe, and if so, the nature of these practices.

Observation of Monitoring—Paragraph (i).

Employees must be able to observe the monitoring process since the right to observe monitoring is mandated by section 8(c)(3) of the Occupational Safety and Health Act. Paragraph (i)(1), which merely restates the observation right given by the Occupational Safety and Health Act, will go into effect.

Some comments expressed concern that allowing employees to observe monitoring would disrupt production because employees would leave their work stations en masse to watch the procedure. It has not been OSHA's experience that employee observation of monitoring is disruptive since in most cases a representative of the employees acts as an observer. The stay is being continued on paragraph (i)(2) which specifically entitles observers to receive an explanation of the measurement procedures, observe all steps related to the noise exposure measurements and record the results obtained. Comments indicated confusion as to the amount of explanation necessary. Therefore, the stay of paragraph (i)(2) will continue on

an interim basis and comments are solicited as to whether paragraph (i)(2) is necessary to assure that employees are afforded a meaningful opportunity to exercise their statutory right to observe monitoring, or whether the performance language of paragraph (i)(1) is sufficient.

Audiometric Testing Program—Paragraph (j).

Qualifications of personnel administering audiometric tests. One commenter interpreted the amendment to provide that only audiologists or medical doctors can test employees' hearing. The standard, however, in paragraph (j)(3) allows trained technicians to perform audiometric tests if they demonstrate competency in administering tests and in the use and care of audiometers. Questions were also raised as to whether nurses could do audiometric testing. All persons who can demonstrate competency in administering tests and in the use of audiometers may administer audiometric tests required by the standard.

Another request was to clarify the requirement that a technician must have "satisfactorily demonstrated competence" in audiometric testing. The proof of competence is left up to the professional who supervises the technician. A certificate of the satisfactory completion of a recognized training program would be one way of meeting the requirement; the Agency believes that on-the-job training may also be effective and technicians may also qualify by this route.

Qualifications of supervisors. One comment addressed the statement in the preamble that the amendment requires certain functions to be carried out by an audiologist, otolaryngologist, "or in the absent of one of these specialists, a qualified physician." However, the standard does not use the words "in the absence of one of these specialists". Therefore, for compliance purposes, the audiologist, otolaryngologist, and other physician are on an equal footing. While the Agency believes that audiologists and otolaryngologists will be in the best position to make judgments about testing procedures and about the validity and interpretation of audiograms, physicians with specialities other than otolaryngology may be quite capable of making these judgments. Also, as explained below, OSHA is considering deleting the word "qualified" as it applies to physicians, since in this context it adds nothing to the meaning or effectiveness of the standard.

Paragraph (j)(3) and paragraph (j)(7)(iii). In the first sentence of paragraph (j)(3) the amendment requires that audiometric tests be performed by a licensed or certified "audiologist, otolaryngologist, or other qualified physican * * *." The same words are used in paragraph (j)(7)(iii), which specifies the qualifications of personnel who review audiograms. Comments to the Agency have requested a clarification of the word "qualified" which precedes "physician". OSHA intended the word "qualified" to mean any licensed physician who believes that he or she has adequate training or knowledge to administer audiometric tests and interpret the results. The Agency believes that the word "qualified" is unnecessary and that adequate professional judgment and responsibility can be assumed. Therefore the Agency is considering deleting the word "qualified" in paragraphs (j)(3) and (j)(7)(iii), and requests comments on the issue.

Also in paragraph (j)(3), the Agency is changing "a *person* who is certified by the Council of Accreditation in Occupational Hearing Conservation" to "a *technician* who is certified by the Council of Accreditation in Occupational Hearing Conservation * * *." This substitution conforms the wording to a sentence later in the same paragraph that reads, "A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or qualified physician." It was suggested that one might interpret this paragraph as meaning that a *person* who is certified by the Council to perform audiometric tests need not be responsible to a professional. OSHA's intent was that all non-professionals engaging in audiometric testing must be responsible to a professional. Therefore non-professionals will be referred to a "technicians" for purposes of the amendment. In addition, the Agency is deleting the words "by an audiometric technician" which precede "who has satisfactorily demonstrated competence * * * ", since these words are now redundant. This deletion does nothing to change the meaning of the requirement.

Baseline audiogram—Paragraph (j)(5). Paragraph (j)(5)(i) required employers to perform baseline audiograms (after the initial phase-in period) within 4 months of an employee's first exposure to noise at or above the action level. Ideally, the baseline audiogram should be conducted before employment, or before exposure to hazardous noise levels in order to avoid contamination by threshold shifts. Any hearing loss, temporary or permanent, that is caused by an employee's work in a noisy area would contaminate the baseline audiogram, making it appear as though the worker had a preexisting hearing loss. Such losses can occur in a matter of months or even days depending on the susceptibility of the individual to noise and the level of exposure. This could result in measuring future losses against a false baseline. Thus the true extent of hearing threshold shifts that have been caused by noise exposure would not be detected.

Pre-employment audiometric testing would be generally feasible for large companies that carry out their own audiometric test programs, or for small companies that send employees to local clinics or doctors' offices for testing. Although the Agency was aware of the need for prompt baseline testing, the principal reason for selecting the 4-month period was that it allowed employers to exclude most seasonal and temporary workers, for whom continued testing and follow-up would be extremely difficult. This 4-month provision took into account the need to take audiograms as soon as possible to reflect the employee's true hearing ability before exposure to workplace noise, and the problems of requiring baseline audiograms on a pre-employment basis. However, such a requirement would probably result in added expenditures for companies that generally rely on mobile test services that come to the plant once a year since these employers would have to send new employees who need baseline audiograms to a local clinic or physician, where the cost per employee would be higher.

In order to investigate more thoroughly the feasibility of obtaining baseline audiograms relatively soon after an employee's initial exposure, the Agency will continue the stay of paragraph (j)(5)(i) insofar as the 4-month period is concerned. Specifically OSHA requests data and information on:

1. Factors precluding baseline testing within 4 months of initial exposure to noise.
2. Whether the requirement to obtain baseline audiograms within 4 months of the initial exposure is unnecessarily stringent.
3. Recommended time periods within which baseline audiometric testing should be conducted for specified TWA's between 85 dB and 110 dB.

Paragraph (j)(5)(ii) requires employers to perform baseline audiograms after employees have been away from workplace noise for at least 14 hours. Paragraph (j)(5)(ii) (*a*) prohibits employers from using hearing protectors as a substitute for the 14 hours without exposure to workplace noise. The reason for the prohibition was that hearing protectors are often fitted and worn improperly, allowing the worker to

be exposed to levels of noise that could cause a temporary hearing loss. As discussed above, any temporary hearing loss caused by an occupational noise exposure would contaminate the baseline audiogram; the baseline would be misleading in that the worker would appear to have less hearing ability than he or she actually does have. Since the first test might not be truly representative of the employee's hearing ability, this could result in measuring future losses against a false yardstick; actual future hearing loss would therefore be understated. OSHA received many objections to the prohibition on the use of hearing protectors for this purpose. Comments stated that many companies would experience a significant hardship, trying to schedule all baseline audiograms before the workshift or paying employees overtime for coming in for testing on days when they were not scheduled to work. Some comments suggested that if the wearing of ear protectors was particularly well supervised on the day of the baseline audiogram (and especially if employees wore ear muffs, which are clearly visible to the supervisor), employees could work in noise for a few hours before being tested without incurring temporary threshold shift. While this is still an open issue, OSHA has decided to stay the prohibition against using hearing protectors to satisfy the 14 hour quiet rule before the baseline audiogram is taken. In addition, the Agency is considering adding language to the standard that explicitly allows the use of hearing protectors to provide the required quiet. The Agency is reopening the record on this issue and requests data, evidence and comments on:

1. Whether hearing protectors will be effective in preventing temporary threshold shift before baseline audiograms.

2. Any steps that are necessary to ensure hearing protector effectiveness on the day of baseline audiometry.

3. The level of quiet and the length of the quiet period before the baseline audiogram which is necessary to insure the integrity of the baseline audiogram.

4. Any experience on the part of those administering or evaluating audiometric examinations that indicates that some baselines may contain temporary threshold shift.

Paragraph (j)(5)(ii)(*b*) requires employers to notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period preceding their baseline audiogram. This requirement was included because the Agency acknowledges the fact that employers cannot be held responsible for hearing loss that is incurred away from the workplace. However, employers could help to minimize the contribution of non-occupational noise exposure to the baseline audiogram by counseling workers ahead to time as to the need for avoiding such exposures. It has been suggested, however, that paragraph (j)(5)(ii)(*b*) may be unnecessary because this kind of notification would normally occur during training which is already required by the standard. Since the paragraph may constitute an unnecessary and redundant requirement, OSHA has decided to continue the stay of this requirement, and to request any comments and information that would justify retaining it in the standard.

Grandfathering of pre-existing baseline and audiograms. Many commenters asked whether or not OSHA would accept the validity of baseline audiograms taken before the effective date of the amendment. Most comments urged the acceptability of audiometric tests that were performed using hearing protectors as a substitute for 14 hours away from workplace noise. Since the prohibition against the use of hearing protectors to achieve the quiet hours is being stayed, OSHA will accept baseline audiograms that were taken using hearing protectors as a substitute for 14 quiet hours. The Agency will continue to accept these audiograms in the future as valid baseline audiograms regardless of the outcome of the stay, and will accept or "grandfather" older baseline audiograms that reflect substantial compliance with the audiometric test requirements of the amendment. For example, to be acceptable, baseline audiograms should be administered by a trained technician, taken at the required test frequencies (500, 1000, 2000, 3000, 4000 and 6000 Hz), in a reasonably quiet room, and with calibrated equipment. The Agency is prepared to be flexible in accepting or grandfathering old baseline audiograms because in most cases this would be more protective of the employee since old baselines will allow the true extent of the hearing loss over the years to be evaluated. Obtaining a new baseline audiogram after many years of noise exposure might be less protective since the new audiogram might show higher thresholds and the true extent of future losses would appear smaller than when compared with the original baseline.

Evaluation of audiogram—Paragraph (j)(7). Paragraph (j)(7)(ii) of the amendment states that audiogram evaluation must be performed by an audiologist, otolaryngologist, or qualified physician. The Agency has combined this section with paragraph (j)(7)(iii), so that it now reads "An audiologist, otolaryngologist, or qualified physician shall review the audiograms to determine whether there is a need for further evaluation." The original first sentence in paragraph (j)(7)(ii) will be deleted since it suggests that a professional must review each audiogram. Professionals do not need to review *every* audiogram. Some comments assumed that the amendment prohibited technicians from reviewing a routine audiogram. Technicians may review audiograms and give only problem audiograms to the professionals for review. The preamble did state that computers could be used to compute shifts shown on audiograms so long as an appropriate professional provided input in the development of the computer program. Although the text of the amendment may have been unclear, it was the Agency's intention that technicians, once they have been adequately trained, could perform the same function, and let the professional review audiograms where the audiogram's validity was in question, or where there might be a medical problem or other problem that would indicate a need for further evaluation.

The Agency has decided that the requirement for the reviewer to determine work relatedness of a significant threshold shift, which is contained in paragraph (j)(7)(iii), should be stayed pending further public comment. A number of comments objected to the requirement, stating that occupational and non-occupational hearing loss can appear to be identical on the audiogram. In some cases it may be very difficult even for an audiologist or physician to determine the cause, or work relatedness, of a threshold shift. This objection also applies to two other portions of the amendment. In paragraph (j)(8)(iv)(*b*), which requires referral for further evaluation as necessary, the words "to determine the cause of the permanent significant threshold shift" will be stayed pending further consideration. Also, paragraph (j)(8)(iv)(*d*) will be stayed pending further public comment. The latter paragraph requires employers to record the existence of a permanent significant threshold shift on the OSHA Form 200 when the professional reviewer determines that the shift is work related. In addition to difficulties in making the determination, the need for such a requirement is questionable since it duplicates the requirements for reporting occupational illnesses and injuries set forth in 29 CFR 1904.2. With respect to these provisions, OSHA is

requesting comments and information on the following:

1. Whether it is necessary to determine the cause of a significant threshold shift in order to protect a worker's hearing.

2. Methods or guidelines for distinguishing between occupational and non-occupational hearing loss.

Paragraph (j)(7)(iv) requires that where annual audiometric testing reveals the presence of a significant threshold shift, a new audiogram shall be given within 60 days to determine if the shift is permanent. There were objections to this provision on the basis that it is extremely difficult to discern if a significant threshold shift is permanent; that the definition of significant threshold shift used in the amendment might result in as many as 30–40% of those tested showing significant threshold shifts and having to be re-tested, and that the burdens of re-testing would be substantial for those employers using mobile audiometric test services. Some of the provisions included in paragraph (j)(7)(iv), such as the requirement that hearing protectors not be used to obtain the necessary quiet hours before re-testing, are inconsistent with the continued stays of other parts of the amendment (see, for example, discussion of paragraph (j)(5)(ii)(*a*)). Moreover, it might not be worthwhile to require retesting without including the requirement for 14 hours away from workplace noise, in that in most cases without this requirement the retest results would be the same. Any benefit that the retest requirement might have is further clouded by the continuing stay of the significant threshold shift definition discussed below. The stay of all the requirements contained in paragraph (j)(7)(iv) will therefore continue. Comments and data are requested on the following issues:

1. Whether retesting within a short period of time to confirm the presence of a significant threshold shift is necessary to the protection of employee hearing.

2. If retesting is necessary, is the requirement that such retesting be accomplished within 60 days appropriate?

Follow-up procedures—Paragraph (j)(8). Paragraph (j)(8)(iv)(*b*) required that employees be referred for a clinical audiological evaluation or an otological examination, as appropriate, under certain circumstances. Some commenters wanted to know who pays for audiometric test referrals. Since employers are responsible for providing employees with a safe and healthful working environment, they must pay for examinations to discover whether or the extent to which a harmful agent in the workplace is affecting employees' health or safety. In addition, they must pay for examinations to discover whether a protective device, which is worn to mitigate adverse effects, is in itself having an adverse health effect. Consequently, employers must bear the expense of referral in cases where the validity or the significance of the test results is questionable or when a pathology of the ear is caused or aggravated by wearing hearing protection. This requirement that employers pay for medical examinations is mandated by section 6(b)(7) of the Act. When the reviewer suspects a medical problem that is not related to the wearing of ear protection (such as an upper respiratory infection), the employer need not assume the cost of further testing or treatment.

Employees who refuse follow-up examination or treatment. Where the standard requires referral for further evaluation, some commenters were concerned that employers would be held responsible for the worker's refusal to go. However, the requirement was phrased in terms of "refer" rather than "require." As long as the employee is referred for further evaluation, the employer has carried out his or her responsibility even if the employee refuses the medical treatment. This is consistent with all OSHA requirements for medical surveillance, which only require that employers make medical examinations available to employees.

Employee notification of significant threshold shift—(STS). Paragraph (j)(8)(iv)(*a*) requires notification of employees within 21 days of the determination of the existence of a significant threshold shift. A number of commenters wanted to know from what point the 21-day period began. The amendment specifies 21 days *from the determination.* For companies with in-house testing capabilities, the determination of STS could occur at the time of testing or at the time the annual audiogram is compared to the baseline. In cases where the company sends its test results to a professional reviewer, the determination would occur when the employer receives the results of the review. Employers should not delay the review of audiograms, since the existence of an STS should be identified as quickly as possible so that protective measures may be initiated.

Revised baseline: Paragraph (j)(9). This paragraph requires baseline audiograms to be revised when subsequent testing reveals either a significant threshold shift, or an improvement in hearing at two or more test frequencies. Some comments requested further guidance on the amount of improvement in hearing thresholds needed to trigger a revision of the baseline. Other questions were submitted concerning whether a revision should be done where an annual audiogram shows improvements at some frequencies and losses at others. The Agency has determined that this section needs to be stayed to be consistent with the stay of the retest requirement. If retests are not performed, professional reviewers will not be able to tell whether a hearing loss is temporary or permanent. If baselines are revised on the basis of a temporary hearing loss, future comparisons would be invalid, and baselines might continually need to be revised, resulting in confused recordkeeping and insufficient protection of employees because of invalid audiogram comparisons. Therefore any requirement for revision of baseline audiograms will be stayed until a decision is made on the subject of retesting.

Consequently the Agency is requesting comments on the following:

1. The need for revising baseline audiograms, when either improvement in hearing or a significant threshold shift occurs.

2. The amount of improvement needed before baseline audiograms should be revised.

Significant threshold shift—Paragraph (j)(10). This paragraph defines significant threshold shift in a manner that becomes progressively more stringent as an employee's hearing loss becomes greater. Unlike the proposal, the amendment allows employers to make a specified correction to the audiogram for aging in determining whether a significant threshold shift has occurred. The Agency received a number of comments requesting that OSHA reconsider the definition of significant threshold shift. Most commenters agreed that a definition of significant threshold shift is necessary. However, many commenters objected to the complexity of the definition chosen, asserting that it would be difficult to evaluate audiograms using the complicated multi-part criteria without a computer and asserting that it would not function as intended. Specifically, some commenters felt that the definition was so stringent that it would result in identifying "normal people" as having significant threshold shifts; others felt that the definition was too lenient to adequately protect young workers with good hearing. OSHA did not intend to require that computers be used to evaluate audiograms. This might place an undue burden on small or medium-sized companies that have their own testing programs. OSHA agrees that the

definition of STS should be reevaluated in light of these comments. For these reasons the Agency has stayed the paragraph defining significant threshold shift, and is reopening the record on this issue. For many employers, this stay will have little effect since it is contemplated that the rulemaking will be completed and that there will be a definition of significant threshold shift in the standard before the first annual audiogram needs to be compared with the baseline. Employers who have ongoing hearing conservation programs with established employee baselines, and who may be taking annual audiograms in this interim period may use any reasonably protective definition. The Agency in its enforcement activities will rely on the definition currently used in its Industrial Hygiene Field Operations Manual, which is 20 dB at any frequency.

Paragraph (j)(10)(v) allows a correction for presbycusis, (hearing loss from aging), when making the determination of significant threshold shift. Non-mandatory Appendix F contains tables of presbycusis values and instructions on how to use them in the determination of significant threshold shift. The effect of allowing these corrections is to reduce the amount of threshold shift. OSHA believes that paragraph (j)(10)(v) and Appendix F should be stayed until the final decision is made on the definition of significant threshold shift. Since employers will be using various interim definitions, corrections for presbycusis may be inappropriate for use with certain definitions. Also, OSHA's final decision on the best definition of significant threshold shift may preclude corrections for presbycusis.

To help resolve the question of the appropriate definition of significant threshold shift, OSHA is requesting the following data and information:

1. The need for any standardized definition of significant threshold shift.
2. Audiograms of noise exposed employees taken over a period of years showing individual hearing histories.
3. Explanations and evidence as to why the amendment's definition of significant threshold shift is too stringent or too lenient.
4. Suggestions of simpler definitions of significant threshold shift that are as protective as the one in paragraph (j)(10).
5. The necessity and appropriateness of presbycusis corrections in combination with definitions of significant threshold shift.
6. The appropriateness of statistical trend analysis in assessing threshold shift of individual employees, as suggested in post promulgation comment number 213.

Audiometric Test Requirements—Paragraph (k).

Audiometer specifications. One comment questioned why references to manual type and computer audiometers were not contained in Appendix C. Use of these types of audiometers is permitted under the standard.

Appendix C was included specifically for pulsed-tone and self-recording audiometers because the ANSI standard S3.6–1969 which is referenced in the amendment does not contain requirements for these instruments. The ANSI standard which is referenced in the amendment does prescribe performance specifications for manual audiometer so there was no need to refer to the manual audiometers in Appendix C. Microprocessor audiometers are allowed by the amendment if they meet the requirements of ANSI S3.6–1969. In order to clarify this point, OSHA is considering adding specific language allowing the use of microprocessor audiometers.

Paragraph (k)(4) states that audiometric examinations must be given in a room meeting the requirements listed in Appendix D, *Audiometric Test Rooms.* In order to obtain accurate audiograms, it is necessary to use a quiet booth or room for testing. Appendix D contains tables that list maximum allowable sound pressure levels in audiometric test rooms. Table D–1 is essentially the same as the current ANSI standard, with a relaxation of 5 dB at 500Hz. Table D–2, taken from the 1960 ANSI standard, contains requirements that are considerably less stringent than those of Table D–1. The amendment allowed background sound pressure levels to be within the limits listed in Table D–2 until April 15, 1983, at which time audiometric test rooms would have to meet the more stringent levels in Table D–1. The reason for the requirement was to enable employers to test employees' hearing to at least 0 dB (referenced to ANSI 1969 audiometric zero) at all test frequencies except 500 Hz.

The Agency received a variety of comments on the issue of whether or not the sound levels in Table D–1 are necessary or feasible for industrial audiometric test programs. Some comments stated that the requirement meant that large rooms with double walls would need to be used, which would take up a considerable amount of space and would be very costly. Others said that compliance with Table D–1 would be extremely difficult for mobile test units, because of the occasional need to park in noisy locations. Some comments also maintained that the levels specified in Table D–1 were appropriate for clinical testing but not for industrial testing. For these reasons OSHA is staying the requirement for complying with Table D–1 in Appendix D. However, employers wishing to purchase audiometric test booths in the near future should bear in mind that the issue of the appropriate background sound pressure levels has not been finally decided. Therefore, in order to avoid potentially costly retrofit or replacement, new purchasers may wish to come as close to meeting the levels in Table D–1 as is practical. With respect to audiometric test rooms, OSHA is requesting information and comments on:

1. Octave band sound pressure levels in existing test rooms used for industrial audiometry.
2. Feasibility of retrofitting rooms not meeting the levels in Table D–1.
3. Criteria for establishing differences between clinical and industrial audiometric test programs, including rationale for selecting the lowest non-masked threshold test levels.

Audiometer calibration—Paragraph (k)(5). Paragraphs (k)(5)(i) and (k)(5)(ii) contain requirements for more extensive calibrations when an audiometer's output deviates from its stated level by more than a certain amount (5 dB or 10 dB). Comments pointed out that the phrase "deviations of more than 5 dB" could literally mean a deviation of only 6 dB, which is a very stringent requirement for triggering an acoustic calibration. Likewise, "deviations of more than 10 dB" could literally mean that a deviation of only 11 dB would trigger an exhaustive calibration. In establishing these requirements, the Agency assumed the use of manual audiometry, which is conducted in 5-decibel increments. Therefore the phrases "deviations of more than 5 dB" or "deviations of more than 10 dB" as used in the above paragraphs were intended to mean deviations of 10 dB and 15 dB respectively. It was pointed out, however, that when self-recording audiometry is used, thresholds can be calculated in 1-decibel increments, in which case 6 dB or 11 dB deviations may appear. Therefore, in order to treat both types of audiometers equally, OSHA will, as an interim measure, interpret the words "more than 5 dB" in these paragraphs to mean 10 dB or greater, and "more than 10 dB" to mean 15 dB or greater. In addition, OSHA requests comments on whether the language of the standard should be changed to explicitly incorporate this interpretation.

One comment interpreted the procedure prescribed in the preamble for checking the functional operation of

the audiometer to preclude use of the electroacoustic ear. The standard's requirement for a daily functional check is twofold; a person with known stable hearing must be tested, and a listening check must also be performed. The electroacoustic ear can be used in place of the testing requirement, but the listening check still must be performed to make sure that the signal is free of unwanted sounds or distortion, and that the general functioning of the audiometer is satisfactory.

Performance Criteria. Post promulgation comment #266a recommended that OSHA consider the analysis of audiometric data as an indicator of the effectiveness of the hearing conservation program. The Agency is interested in exploring this kind of approach, and requests data, information, and comments on the following:

1. Methods of evaluating the effectiveness of hearing conservation programs.

2. Criteria for judging program effectiveness through audiometric test data.

a. Where hearing threshold shift is the criterion, the amount of threshold shift deemed to be acceptable, the length of time over which the shift occurs, and the percentage of the population exhibiting such shifts.

b. Where hearing level is the criterion, the amount of occupational hearing loss deemed to be acceptable in a population, the non-occupational hearing loss data used for comparison purposes, and the duration of exposure.

Hearing Protectors—Paragraph (1).

Hearing protectors above 85 dB. One commenter mentioned that his company requires the use of hearing protectors by all employees exposed to sound levels of 85 dB regardless of the duration of the exposure. Similarly, others believed that OSHA should require the use of protectors for all employees exposed to a TWA of 85 dB or greater. Under the standard, the wearing of protectors is mandatory for workers whose exposures exceed 90 dB and for workers who have experienced a significant threshold shift, but only voluntary for other workers whose exposures exceed 85 dB. This combination of requirements is designed to provide necessary protection, but not require hearing protector use where the risk of material impairment is relatively small.

If an employer finds it more efficient and easier to promote employee use of hearing protectors by requiring hearing protector use by all employees exposed to levels of 85 dB or greater, this is permissible since it is more protective than the OSHA requirement. OSHA considers its requirement to be a minimum, and employers are free to require measures that are more protective than those specified in the standard.

Hearing protector replacement—Paragraph (1)(i). One comment interpreted the amendment's requirement that "hearing protectors shall be replaced as necessary," to mean that employers have to pay for lost or mutilated protectors. The Agency believes that employers should not have to pay for an unlimited supply of protectors or replace protectors that have been lost due to employee negligence. Employers may formulate their own reasonable policies as to how many free replacement protectors to supply. Although employers must replace worn out protectors, they should not have to bear the expense in cases where employees have been irresponsible.

Hearing protector attenuation—Paragraph (m). The amendment requires employers to evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. Employers may use any of the methods listed in Appendix G to do this. The easiest method involves the use of the Noise Reduction Rating (NRR) which is printed on the hearing protector package.

One comment expressed concern that employers who wish to use the NRR because of its simplicity would be penalized because of its conservative correction factors. Others, however, noted that the NRR may not be nearly conservative enough. Research has shown that hearing protectors are not as effective in real life conditions as they are in the laboratory. OSHA believes that because of its simplicity the NRR is the best method available at this time, and employers are encouraged to use it. The Agency does, however, caution employers that the NRR values may be unrealistically high. Employers should use extra care in fitting and supervising the use of hearing protectors when the full amount of the NRR is needed. Some recent information submitted to the Agency suggests that only about half the attenuation predicted by the NRR is actually obtained in field use (see post-promulgation comment 266).

In addition, OSHA has recently learned that the Environmental Protection Agency's Office of Noise Abatement, which required the labelling of hearing protectors with the NRR, will soon be abolished. OSHA does not know at this time whether the EPA labelling regulation will be rescinded, and if so whether hearing protector manufacturers will continue to use the NRR voluntarily. Therefore the Agency may need to amend Appendix G so that estimations of hearing protector attenuation more adequately predict the attenuation received in actual use. Consequently the Agency is reopening the record and is requesting data and information on:

1. Ear muff and ear plug attenuation in field conditions.

2. Simple field methods for evaluating hearing protector attenuation.

3. Suggested corrections to the NRR.

Certain portions of Appendix G (which gives various methods of determining the attenuation of hearing protectors) have been stayed insofar as they make reference to Appendix B, which has also been stayed. After evaluating the comments, the Agency may delete the second part of Appendix G's paragraph (iii)(A), the second part of paragraph (iv)(A) and its accompanying footnote, and paragraph (iv)(B), all of which refer to Appendix B, or identified time segments which are described in Appendix B. In addition, procedures for estimating attenuation using sound level meters and area monitoring may be added to Appendix G. For example, the following types of provisions may be added:

(v) When using area monitoring procedures and a sound level meter set to the A-weighting network:

(A) Obtain a representative sound level for the area in question.

(B) Subtract 7 dB from the NRR and subtract the remainder from the A-weighted sound level for that area.

(vi) When using area monitoring procedures and a sound level meter set to the C-weighting network:

(A) Obtain a representative sound level for the area in question.

(B) Subtract the NRR from the C-weighted sound level for that area.

Comments are invited on the above and similar suggestions.

Hearing protector selection—Paragraph (1)(3). Some comments reflected a misunderstanding of the intent of the requirement for giving employees an opportunity to choose hearing protectors from a variety of protectors. Some suggested that the requirement entailed providing employees with a shopping list of different brands and types of protectors. The intent of the requirement is that workers should have more than one type of device, more than one size (where the devices come in different sizes), and preferably three or more devices to choose from. The reason for this requirement is that ear canals come in many shapes and sizes, and even the same person can have two differently sized ear canals. Characteristics of the noise environment, such as temperature,

humidity, and presence of dust, grease, or metal particles, also have a bearing on the choice of protectors. A protector that is suitable for a hot environment may not be the best one in a greasy environment. Once employers and employees have settled on the types and sizes of protectors that will be worn, there is no need to keep a varied selection always available.

One commenter interpreted the requirement as meaning that employees alone would make the hearing protector selection. This was not the intention of the Agency. The Agency believes that the employee and the employer (who should have some knowledge of the fundamentals of hearing protection) should work together in selecting the right protector. While the employer may know about attenuation values and other technical considerations, the employee is the best person to judge the protector's comfort. If the protector is uncomfortable, it is not likely to be worn properly, and may not be worn at all.

Training Program—Paragraph (n).

The Agency received a number of requests to reconsider the training requirements. Comments objected to the specificity of the requirements, saying that it would impede the employer's flexibility to conform the program to the needs of his own employees. Some pointed out that some of the training requirements exceed the information that employees need to know to protect their hearing. Therefore OSHA has made effective only those requirements for training that it believes are essential to the success of the hearing conservation program. The remaining requirements are stayed pending consideration of further comments on their necessity.

Paragraph (n)(3)(i) has been stayed because the Agency believes that the requirements may be redundant. Employees have access to the noise standard under paragraph (o)(1), concerning access to information and training materials.

Paragraphs (n) (3) (iii), (n) (3) (iv), and (n) (3) (v) are stayed since information about engineering and administrative controls and the employer's compliance plan may not be relevant to the employee's understanding of or cooperation in the hearing conservation program. In light of these stays, employers may be able to avail themselves of pre-prepared training materials such as pamphlets or films, which are professionally prepared and which may be more effective and less expensive than individually developed programs.

OSHA requests comments and information on the necessity of the above stayed training requirements for effective hearing conservation programs. In addition, comments are requested on whether there are any *disadvantages* in including such provisions in a regulation for hearing conservation programs.

Warning Signs—Paragraph (p).

Comments objected to the requirements for warning signs, stating that the signs would be costly and inconvenient, and that confusion would result as to whether hearing protection was advisory or mandatory in certain areas. In light of these comments, the requirements for warning signs will be stayed pending further comment.

OSHA is requesting information on the following:

1. Educational value of warning signs.
2. Necessity of requiring warning signs to have an effective hearing conservation program.

Recordkeeping—Paragraph (q).

OSHA received numerous requests to reconsider the amendment's recordkeeping requirements. Comments objected to the detailed nature of the provisions, the burden on small and medium-sized companies, and the redundancy of some of the requirements. OSHA has therefore decided to reduce the extent of the recordkeeping requirements in the interim by staying certain provisions. Comments are invited on whether these provisions are necessary for the hearing conservation amendment or whether they should be deleted.

Exposure measurements—Paragraph (q)(1). The Agency is staying and seeking comment on all of paragraph (q)(1) except for the general requirement in paragraph (q)(1)(i) to " maintain an accurate record of all employee exposure measurements required by * * * [paragraph (e) of] this section". The bracketed words in paragraph (q)(1)(i), as well as all of paragraph (q)(1)(ii) are also being stayed to be consistent with the interim stays affecting most of the specific monitoring requirements in paragraphs (e) through (h). These paragraphs require the retention of detailed information such as names of persons whose exposures were actually measured, date of last laboratory calibration, the type of measuring equipment used, and the date and location of measurements. Comments are requested on whether any of the information required by the paragraphs covered by the interim stay is necessary to achieve a successful hearing conservation program.

Audiometric tests—Paragraph (q)(2).

OSHA is also staying and inviting further comments on the second part of paragraph (q)(2)(ii)(*c*), which requires records of the qualifications of the person who administered the audiometric test, and paragraph (q)(2)(ii)(*d*), which requires records of the manufacturer and model of the audiometer. While employers may wish to keep this information to help them to evaluate various aspects of their own programs, the Agency believes that it may not be necessary for the standard to require that such information be kept.

In addition, OSHA is staying and inviting comment on the possible deletion of paragraph (q)(2)(ii)(*g*), which requires a statement as to whether the sound pressure levels in the test room meet those specified in Tables D–1 or D–2 of Appendix D. This is consistent with the stay of Table D–1. In addition, this provision is redundant with the requirement in paragraph (q)(3) to record the background sound pressure levels in audiometric test rooms. Some envisioned that employers would have to list background sound pressure levels on each and every audiogram. The Agency's intention was merely that the background sound pressure levels be kept with the audiometric test record, not necessarily *on* each record. The stay of this provision will focus attention on the similar requirement in paragraph (q)(3) and clarify the issue.

Audiometric test rooms—Paragraph (q)(3).

OSHA is staying and considering the deletion of paragraph (q)(3)(ii), which specifies the audiometric frequencies for which sound pressure level measurements are to be kept, and requires noting the date of the measurement. OSHA has stayed these requirements because they are not believed to be necessary in view of the fact that Table D–2 in Appendix D already gives the pertinent frequencies. In addition, the Agency believes that employers will note the date of measurement as a matter of course. The Agency requests comments on the necessity of retaining such a provision.

Calibration of audiometers—Paragraph (q)(4).

Similarly, since the date of the last acoustic or exhaustive calibration of the audiometer also must be kept with the employee's audiometric test record, keeping a separate record of calibration results is unnecessary. OSHA is therefore considering deleting paragraph (q)(4) in its entirety.

Record retention—Paragraph (q)(5).

The Agency is staying and is considering deleting paragraphs (q)(5)(iii) and (q)(5)(iv), requiring that records of test room sound pressure levels and audiometer calibrations be kept for 5 years, to be consistent with

the deletion of the requirement that such information be kept as a separate record. The provisions for record retention in paragraph (q)(5)(i) requiring the retention of noise exposure measurement records for 2 years are going into effect. Paragraph (q)(5)(ii) is being partially stayed insofar as employers have to retain such records for 5 years after termination of employment. Employers will, however, be required to retain audiometric test records for the length of employment. OSHA invites comments on whether the retention period for audiometric test records (length of employment plus 5 years) in paragraph (q)(5)(ii) is necessary for a successful hearing conservation program. Since audiometric test records can be valuable to employees after they have left a company, OSHA also invites comments on whether employers should be required to offer a departing employee his or her audiometric test records.

Recordkeeping Clearance. As noted above, this standard contains recordkeeping requirements, some of which are going into effect now and some of which are being stayed pending receipt and review of further comments on the necessity of the requirements. The recordkeeping requirements in the amendment have been approved by the Office of Management and Budget pursuant to the Paperwork Reduction Act of 1980, Public Law 96–511, 44 U.S.C. Chapter 35. The OMB approval number is 1218–0048.

Custody of Records. The question was raised as to whether the amendment requires employers to keep records at the workplace. The Agency recognizes that some employers, especially small companies, may prefer to hire contractors to fulfill their hearing conservation requirements, and may choose to have the contractors keep the records. This is acceptable to OSHA as long as all records are readily available in case they are needed by the employer, employees, designated representatives, or by OSHA.

Appendices—Paragraph (r).

In paragraph (r)(2) reference to Appendix B (Temporal Sampling Procedures for Use With a Sound Level Meter) and Appendix F (Calculations and Application of Age Corrections to Audiograms) has been stayed to be consistent with the stays of Appendix B and Appendix F.

Effective dates—Paragraph (s).

Since the amendment will become effective on August 22, 1981 instead of April 15, 1981, the start-up dates contained in paragraphs (s)(2) and (s)(3) for completion of monitoring and baseline audiograms are being adjusted to reflect the same amount of time given in the January 16, 1981 amendment. Accordingly, monitoring must be completed by February 22, 1982, and baseline audiograms must be completed by August 22, 1982. In paragraph (s)(2), references to the initial determination and to paragraph (d) have been stayed to be consistent with the stay of paragraph (d), requiring initial determinations.

Paragraphs (s)(4) concerning the effective date for the more stringent requirements for background sound pressure levels in audiometric test rooms and (s)(5), concerning the effective date for the more stringent requirements for noise dosimeters, are being stayed to be consistent with the staying of these substantive requirements in Table D–1 of Appendix D and paragraph (g) respectively.

Other Alternatives. Possible alternatives to the hearing conservation standard have been suggested to the Agency. These alternatives might include the following provisions:

1. Employers shall conduct audiograms annually of every employee exposed to noise in excess of an 8-hour time weighted average sound level (TWA) of 85 dBa,[1] according to standards on audiometers and audiometric test rooms established by the American National Standards Institute,[2] and under the supervision of a qualified technician;

2. Such audiograms shall be reviewed annually by a qualified audiologist, otolaryngologist or physician to identify employees whose hearing acuity has diminished more than normal;

3. Employers shall instruct all employees identified under paragraph 2 in the proper use of hearing protection when working in noisy areas and shall take appropriate measures to enforce the use of suitable protective devices for those employees when they are exposed to noise levels in excess of an 8-hour time weighted average sound level (TWA) of 85 dBa.

The purpose of this suggestion is to determine whether the goal of hearing conservation could be achieved by a performance standard that does not contain detailed compliance requirements but rather leaves implementation to physicians and other experts in the field. One of the benefits of the suggestion, for example, may be that more employees would read and fully understand the standard. In addition, small employers whose resources may be limited might themselves be better able to comply because of the brevity and simplicity of this alternative. As a result of a greater understanding on the part of both employees and employers, more effective compliance with the standard may be encouraged.

OSHA invites comments on the above alternative, especially with respect to the following points:

1. Do the above provisions constitute an adequate hearing conservation program? Would the protection provided to workers against noise-induced hearing loss by the above provisions be comparable to the protection provided by the hearing conservation amendment as issued? What evidence supports the conclusions of comparability or non-comparability?

2. How would the employer's compliance with the above provisions differ from the actions necessary for compliance with the hearing conservation amendment? What would be the impact of these differences on costs of compliance?

3. How would OSHA enforcement of the above provisions differ from enforcement of the hearing conservation amendment?

OSHA will consider the comments submitted on these alternative provisions and the responses to the questions listed in deciding whether any further rulemaking activity on the matters included in the alternative is warranted.

IV. Summary of Regulatory Impact Analysis

A Regulatory Impact Analysis, consistent with the requirements of Executive Order 12291 has been prepared. The document discusses, *inter alia*, the costs of the hearing conservation provisions published in January and the costs of the provisions going into effect on August 22, presents information on relative cost-effectiveness between the two sets of provisions, and describes the impact on small business, consistent with the Regulatory Flexibility Act.

As mentioned in the background section of this **Federal Register** notice, the total cost of the amendment published in January was estimated to be $269 million or an average of $53 per worker included in hearing conservation programs mandated by the amendment. The Regulatory Impact Analysis also presents recalculated costs of $234.6 million for the January amendment. This adjustment was based on new information. The provisions going into effect on August 22 are considerably less costly: these provisions are estimated to result in total costs of $181.5 million or an average of $36 per worker per year. After adjusting for current compliance activities, the

[1] See Appendix A.

[2] American National Standards Institute (ANSI) Specification for Audiometers, S3.6–1969, and the Institute's Specification for Audiometric Test Rooms, ANSI S3.1–1977. Audiometers shall be calibrated annually to ensure the standard is met. ANSI S3.1–1977 must be followed for testing performed at frequencies of 1,000 Hz and above; for testing below Hz, ANSI S3.1–1960 may be used.

provisions going into effect on August 22 will result in $170.6 million in new costs.

The Regulatory Impact Analysis relies on the benefits calculations of the Regulatory Analysis which was prepared for the amendment published in January 16, 1981. OSHA estimated that hearing conservation programs for all employees exposed above 85 dB would eliminate 212,000 cases of material impairment of hearing after 10 years, 696,000 after 30 years and 898,000 cases at equilibrium. Even assuming full compliance with the present standard which requires hearing conservation programs for all employees exposed over 90 dB, the amendment would prevent 38,000 additional impairments within 10 years, 143,000 within 30 years, and 189,000 at equilibrium. Therefore the standard would significantly reduce the risk of hearing impairment present in many workplaces. The original benefits estimates assumed that the provisions in the amendment formed a system of checks and balances to assure that employees who were highly susceptible to noise would be identified and prevented from incurring material impairment by intervening at an early stage with counseling, training, retesting and professional evaluation where necessary. Because of the interrelated nature of the hearing conservation provisions, it is very difficult to predict what effect the relaxation of any requirement or group of requirements will have on the benefits predicted.

Copies of the Regulatory Impact Analysis can be obtained from the Docket Office, at the address listed in the "Address" section at the beginning of this Federal Register document. Comments, including analysis and data to support any conclusions drawn, are invited on the following issues:

1. Whether it is appropriate to assume that the provisions going into effect on August 22 will be adequate to achieve the benefits predicted.
2. Whether the continued stay of certain provisions has lowered the costs and simultaneously diminished the benefits likely to be realized.
3. Whether general performance requirements for noise exposure monitoring are sufficient to identify all employees who need to be included in hearing conservation programs so that they will receive the benefits of such programs.
4. Whether the provisions going into effect August 22 represent a cost-effective alternative to the January 16 amendment.

V. Environmental Impact

On February 19, 1974 OSHA announced in the **Federal Register** its intention to prepare an Environmental Impact Statement assessing the impact of a standard that would be proposed for occupational noise exposure (See 39 FR 6119). Information was solicited from the public on a variety of environmentally related issues including possible environmental impacts of the recommended standard and any irreversible commitments of resources which would be involved if the standard should be implemented.

A draft Environmental Impact Statement was made available to the public on June 16, 1975 (40 FR 25525) and environmental impact was specifically an issue at the first hearing held in 1975.

A Final Environmental Impact Statement was prepared in accordance with the Council on Environmental Quality (CEQ) Guidelines (40 CFR 1500 *et seq.*) and the Department of Labor's regulations setting out procedures to be used by Department of Labor agencies to insure compliance with the National Environmental Policy Act (29 CFR Part 11). The final Environmental Impact Statement was made available to the public at the time the final rule was published. The Final Environmental Impact Statement concluded that the hearing conservation amendment would beneficially impact the workplace environment by reducing both the incidence and the degree of hearing loss among workers. It also concluded that the incidence of other adverse health effects associated with noise exposure might also be reduced.

OSHA does not believe that staying various provisions of the amendment will have any significant environmental impact. Therefore, no revised Environmental Impact Statement is necessary. Comments and data are requested on whether the Agency's action today will have any significant environmental impact.

VI. Conclusion

Comments and data are hereby requested in response to the specific questions posed in the discussion above. In addition, interested persons are invited to submit any other relevant comments and data on any of the provisions which have been reopened for comment. These substantive comments must be submitted in accordance with the procedures outlined in the Public Participation section (see section II. B), and be received by November 23, 1981.

The stay is still in effect for all or part of the paragraphs listed below. Comments are specifically requested as to whether the interim stay of these provisions should remain in effect pending the submission and evaluation of substantive comments on these provisions. Comments on the interim stays must be submitted in accordance with the procedures outlined in the Public Participation section (see section II. A), and must be received by September 22, 1981.

A. Provisions Stayed

Paragraph (d).
Paragraph (e), except for part of (e)(1).
Paragraph (f).
Paragraph (g), except for part of (g)(2)(ii)(*b*).
Paragraph (h).
Paragraph (i), except for part of (i)(1).
Part of paragraph (j)(5)(i).
Paragraph (j)(5)(ii)(*a*).
Paragraph (j)(5)(ii)(*b*).
Part of paragraph (j)(7)(i).
Part of paragraph (j)(7)(ii).
Part of paragraph (j)(7)(iii).
Paragraph (j)(7)(iv).
Part of paragraph (j)(8).
Paragraph (j)(8) (iii) and (iv).
Part of paragraph (j)(8)(iv) (*a*) and (*b*).
Paragraph (j)(8)(iv)(*d*).
Paragraph (j)(9).
Paragraph (j)(10).
Part of paragraph (1)(2)(i).
Paragraph (n)(3) (i), (iii), (iv) and (v).
Paragraph (p).
Part of paragraph (q)(1)(i).
Paragraph (q)(1)(ii).
Part of paragraph (q)(2)(ii)(*c*).
Paragraph (q)(2)(ii)(*d*).
Paragraph (q)(2)(ii)(*g*).
Paragraph (q)(3)(ii).
Paragraph (q)(4).
Part of paragraph (q)(5)(ii).
Part of paragraph (q)(5) (iii) and (iv).
Part of paragraph (r)(2).
Part of paragraph (s)(2).
Paragraph (s)(4).
Paragraph (s)(5).
Appendix B is stayed in its entirety.
Part of appendix D, including Table D–1.
Appendix F.
Part of Appendix G.

B. Technical Amendments

§ 1910.95 [Amended]

For the reasons set out in the preamble, Part 1910 of Title 29, Code of Federal Regulations, is amended as set forth below.

1. Paragraph (c) of § 1910.95 is amended by inserting the words "slow response" after "85 decibels measured on the A scale".

2. Paragraph (j)(3) of § 1910.95 is amended by deleting the word "person" in the first sentence and inserting the word "technician" in its place. Also in the first sentence, the words "by an audiometric technician" are removed.

3. Paragraph (j)(7)(ii) of § 1910.95 is amended by removing the first sentence which states "such evaluation shall be performed by an audiologist, otolaryngologist, or qualified physician"

and inserting in its place paragraph (j)(7)(iii) as amended below.

4. Paragraph (j)(7)(iii) of § 1910.95 is amended by removing the word "the" before "audiologist" and inserting the word "an" in its place; in addition, the word "also" is removed.

5. Paragraph (k)(5)(iii) of § 1910.95 is amended by inserting the words "and above 6000 Hz" after the words "below 500 Hz" in the second sentence.

6. Paragraph (r)(2) of § 1910.95 is amended by removing the words "appendices B, F and" before "H"; the word "are" which appears twice in the sentence is removed and the word "is" is inserted in its place.

7. Paragraph (s)(1) of § 1910.95 is amended by removing the words "April 15, 1981" and inserting "August 22, 1981" in its place.

8. Paragraph (s)(2) of § 1910.95 is amended by removing the words "October 15, 1981" and inserting "February 22, 1982" in its place.

9. Paragraph (s)(3) of § 1910.95 is amended by removing the words "April" 15, 1982" and inserting "August 22, 1982" in its place.

10. Paragraph I. (1)(ii) in Appendix A of § 1910.95 is corrected by removing "C_nT_n" and inserting "C_n/T_n" in its place.

11. Table E–2 in Appendix E of § 1910.95 is corrected by changing "TDH–39" in the middle column heading to read "TDH–49".

12. In Appendix H of § 1910.95, the address given for the Superintendent of Documents in the right hand column of the chart is corrected by changing the zip code from "20404" to "20402".

C. Provisions Going Into Effect August 22

The text of the hearing conservation amendment contained in § 1910.95(c)–(s) and appendices A–I to § 1910.95 currently in effect is shown below.

§ 1910.95 Occupational noise exposure.

* * * * *

(c) *Hearing conservation program.* The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (s) of this section whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale slow response or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with Appendix A and Table G–16a, and without regard to any attenuation provided by the use of personal protective equipment.

(e) *Monitoring.* (1) When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall obtain measurements for employees who may be exposed at or above that level.

(g)(2)(ii)(*b*) All continuous, intermittent and impulsive sound levels from 80 dB to 130 dB shall be integrated into the computation.

(i) *Observation of monitoring.* (1) The employer shall provide affected employees or their representatives with an opportunity to observe any measurements of employee-noise exposure which are conducted pursuant to this section.

(j) *Audiometric testing program.* (1) The employer shall establish and maintain an audiometric testing program as provided in this paragraph by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels.

(2) The program shall be provided at no cost to employees.

(3) Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other qualified physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and calibrating audiometers. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or qualified physician.

(4) All audiograms obtained pursuant to this section shall meet the requirements of Appendix C: *Audiometric Measuring Instruments.*

(5) *Baseline audiogram.* (i) The employer shall establish for each employee so exposed a valid baseline audiogram against which subsequent audiograms can be compared.

(ii) Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise.

(6) *Annual audiogram.* (i) At least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above a time-weighted average of 85 decibles.

(ii) Annual audiometric testing may be conducted at any time during the workshift.

(7) *Evaluation of audiogram.* (i) Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a significant threshold shift has occurred.

(ii) An audiologist, otolaryngologist, or qualified physician shall review the audiograms to determine whether there is need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

(*a*) A copy of the requirements for hearing conservation as set forth in paragraphs (c) through (r) of this section;

(*b*) The baseline audiogram and most recent audiogram of the employee to be evaluated;

(*c*) Measurements of background sound pressure levels in the audiometric test room as required in Appendix D: *Audiometric Test Rooms.*

(*d*) Records of audiometer calibrations required by paragraph (k)(5) of this section.

(8) *Follow-up procedures.* If a comparison of the annual audiogram to the baseline audiogram indicates a significant threshold shift the employer shall ensure that the following steps are taken:

(i) Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

(ii) Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.

(iv)(*a*) Inform the employee in writing, within 21 days of the determination, of the existence of a significant threshold shift;

(*b*) Refer the employee for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear (as defined in Appendix I) is caused or aggravated by the wearing of hearing protectors;

(*c*) Inform the employee of the need for an otological examination if a medical pathology of the ear which is unrelated to the use of hearing protectors is suspected.

(k) *Audiometric test requirements.* (1) Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

(2) Audiometric tests shall be conducted with equipment that meets the specifications of, and is maintained

and used in accordance with, American National Standard Specification for Audiometers, S3.6–1969.

(3) Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix C: *Audiometric Measuring Instruments.*

(4) Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix D: *Audiometric Test Rooms.*

(5) *Audiometer calibration.* (i) The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of more than 5 dB shall require an acoustic calibration.

(ii) Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix E: *Acoustic Calibration of Audiometers.* Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of more than 10 dB necessitate an exhaustive calibration.

(iii) An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3; 4.1.4.3; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6–1969. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

(l) *Hearing protectors.* (1) Employers shall make hearing protectors available to all employees exposed to a time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

(2) Employers shall ensure that hearing protectors are worn by all employees:

(i) Who are exposed to a time-weighted average of 85 decibels or greater and who have experienced a significant threshold shift; or

(ii) Who are required by paragraph (b)(1) of this section to wear personal protective equipment.

(3) Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.

(4) The employer shall provide training in the use and care of all hearing protectors provided to employees.

(5) The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

(m) *Hearing protector attenuation.* (1) The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used by one of the methods described in Appendix G: *Methods for Estimating the Adequacy of Hearing Protector Attenuation.*

(2) Hearing protectors must attenuate employee exposure at least to a time-weighted average of 90 decibels as required by paragraph (b) of this section.

(3) For employees who have experienced a significant threshold shift, hearing protectors must attenuate employee exposures to a time-weighted average of 85 decibels or below.

(4) The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

(n) *Training program.* (1) The employer shall institute a training program for all employees who are exposed to noise at or above a TWA of 85 dB, and shall ensure employee participation in such program.

(2) The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

(3) The employer shall ensure that each employee is informed of the following:

(ii) The effects of noise on hearing;

(vi) The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

(vii) The purpose of audiometric testing, and an explanation of the test procedures.

(o) *Access to information and training materials.* (1) The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

(2) The employer shall provide to affected employees any informational materials pertaining to this standard that are supplied to the employer by the Assistant Secretary.

(3) The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the Assistant Secretary and the Director.

(q) *Recordkeeping.* (1) *Exposure measurements.* (i) The employer shall maintain an accurate record of all employee exposure measurements required by this section.

(2) *Audiometric tests.* (i) The employer shall retain all employee audiograms obtained pursuant to paragraph (j) of this section;

(ii) This record shall include:

(*a*) Name and job classification of the employee;

(*b*) Date of the audiogram;

(*c*) The examiner's name;

(*e*) Date of the last acoustic or exhaustive calibration of the audiometer;

(*f*) Employee's most recent noise exposure assessment;

(3) *audiometric test rooms.* (i) The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

(5) *Record retention.* The employer shall retain records required in this paragraph (q) for at least the following periods:

(i) Noise exposure measurement records shall be retained for 2 years.

(ii) Audiometric test records shall be retained for the duration of the affected employee's employment.

(6) *Access to records.* All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee and the Assistant Secretary. The provisions of 29 CFR 1910.20(a)–(e) and (g)–(i) apply to access to records under this section.

(7) *Transfer of records.* If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in paragraph (q)(5) of this section.

(r) *Appendices.* (1) Appendices A, C, D, E, G, and I to this section are incorporated as part of this section and the contents of these Appendices are mandatory.

(2) Appendix H to this section is informational and is not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

(s) *Effective dates.* (1) Paragraphs (c)–(r) of this section shall become effective August 22, 1981 unless otherwise noted below.

(2) Monitoring conducted pursuant to paragraph (e) of this section shall be completed by February 22, 1982.

(3) Baseline audiograms required by paragraph (j) of this section shall be completed by August 22, 1982.

Appendix A: Noise Exposure Computation

This Appendix is Mandatory

I. Computation of Employee Noise Exposure

(1) Noise dose is computed using Table G–16a as follows:

(i) When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by: D=100 C/T where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table G–16a or by the formula shown as a footnote to that table.

(ii) When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by:
$D=100\ (C_1/T_1+C_2/T_2+\ldots+C_n/T_n)$,
where C_n indicates the total time of exposure at a specific noise level, and T_n indicates the reference duration for that level as given by Table G–16a.

(2) The eight-hour time-weighted average sound level (TWA), in decibels, may be computed from the dose, in percent, by means of the formula: $TWA=16.61\ \log_{10}(D/100)+90$. For an eight-hour workshift with the nose level constant over the entire shift, the TWA is equal to the measured sound level.

(3) A table relating dose and TWA is given in Section II.

Table G–16a

A-weighted sound level, L (decibel)	Reference duration, T (hour)
80	[illegible]
81	[illegible]
82	[illegible]
83	21.1
84	18.4
85	[illegible]
86	13.9
87	12.1
88	[illegible]
89	[illegible]
90	[illegible]
91	7.0
92	[illegible]
93	5.3
94	4.6
95	[illegible]
96	3.5
97	3.0
98	[illegible]
99	2.3
100	[illegible]
101	1.7
102	1.5
103	1.4
104	1.3
105	1
106	0.87
107	0.76
108	[illegible]
109	0.57
110	0.5
111	0.44
112	0.38
113	0.33
114	[illegible]
115	[illegible]
116	0.22
117	0.19
118	0.16
119	0.14
120	0.125
121	0.11
122	[illegible]
123	[illegible]
124	0.072
125	0.063

Table G–16a—Continued

A-weighted sound level, L (decibel)	Reference duration, T (hour)
126	0.054
127	[illegible]
128	0.041
129	0.036
130	0.031

In the above table the reference duration, T, is computed by

$$T=\frac{8}{2^{(L-90)/5}}$$

where L is the measured A-weighted sound level.

II. Conversion Between "Dose" and "8-Hour Time-Weighted Average" Sound Level

Compliance with paragraphs (c)–(r) of this regulation is determined by the amount of exposure to noise in the workplace. The amount of such exposure is usually measured with an audiodosimeter which gives a readout in terms of "dose." In order to better understand the requirements of the amendment, dosimeter readings can be converted to an "8-hour time-weighted average sound level" (TWA).

In order to convert the reading of a dosimeter into TWA, see Table A–1, below. This table applies to dosimeters that are set by the manufacturer to calculate dose or percent exposure according to the relationships in Table G–16a. So, for example, a dose of 91 percent over an eight hour day results in a TWA of 89.3 dB, and, a dose of 50 percent corresponds to a TWA of 85 dB.

If the dose as read on the dosimeter is less than or greater than the values found in Table A–1, the TWA may be calculated by using the formula: $TWA=16.61\ \log_{10}(D/100)+90$ where TWA=8-hour time-weighted average sound level and D=accumulated dose in percent exposure.

Table A–1.—*Conversion From "Percent Noise Exposure" or "Dose" to "8-Hour Time-Weighted Average Sound Level" (TWA)*

Dose or percent noise exposure	TWA
10	73.4
15	[illegible]
20	[illegible]
25	[illegible]
30	[illegible]
35	[illegible]
40	[illegible]
45	84.2
50	[illegible]
55	85.7
60	[illegible]
65	[illegible]
70	[illegible]
75	[illegible]
80	[illegible]
81	[illegible]
82	88.6
83	88.7

Table A–1.—*Conversion From "Percent Noise Exposure" or "Dose" to "8-Hour Time-Weighted Average Sound Level" (TWA)*—Continued

Dose or percent noise exposure	TWA
84	88.7
85	88.8
86	88.9
87	88.9
88	89.1
89	89.2
90	89.2
91	89.3
92	89.4
93	89.5
94	89.6
95	89.6
96	89.7
97	89.8
98	89.9
99	89.9
100	90.0
101	90.1
102	90.1
103	90.2
104	90.3
105	90.4
106	90.4
107	90.5
108	90.6
109	90.6
110	90.7
111	90.8
112	90.8
113	90.9
114	90.9
115	91.1
116	91.1
117	91.1
118	91.2
119	91.3
120	91.3
125	91.6
130	91.9
135	92.2
140	92.4
145	92.7
150	92.9
155	93.2
160	93.4
165	93.6
170	93.8
175	94.0
180	94.2
185	94.4
190	94.6
195	94.8
200	95.0
210	95.4
220	95.7
230	96.0
240	96.3
250	96.6
260	96.9
270	97.2
280	97.4
290	97.7
300	97.9
310	98.2
320	98.4
330	98.6
340	98.8
350	99.0
360	99.2
370	99.4
380	99.6
390	99.8
400	100.0
410	100.2
420	100.4
430	100.5
440	100.7
450	100.8
460	101.0
470	101.2
480	101.3
490	101.5
500	101.6
510	101.8
520	101.9
530	102.0
540	102.2
550	102.3

Table A-1.—*Conversion From "Percent Noise Exposure" or "Dose" to "8-Hour Time-Weighted Average Sound Level" (TWA)*—Continued

Dose or percent noise exposure	TWA
560	102.4
570	102.6
580	102.7
590	102.8
600	102.9
610	103.0
620	103.2
630	103.3
640	103.4
650	103.5
660	103.6
670	103.7
680	103.8
690	103.9
700	104.0
710	104.1
720	104.2
730	104.3
740	104.4
750	104.5
760	104.6
770	104.7
780	104.8
790	104.9
800	105.0
810	105.1
820	105.2
830	105.3
840	105.4
850	105.4
860	105.5
870	105.6
880	105.7
890	105.8
900	105.8
910	105.9
920	106.0
930	106.1
940	106.2
950	106.2
960	106.3
970	106.4
980	106.5
990	106.5
999	106.6

Appendix C: Audiometric Measuring Instruments

This Appendix is Mandatory

1. In the event that pulsed-tone audiometers are used, they shall have a tone on-time of at least 200 milliseconds.

2. Self-recording audiometers shall comply with the following requirements:

(A) The chart upon which the audiogram is traced shall have lines at positions corresponding to all multiples of 10 dB hearing level within the intensity range spanned by the audiometer. The lines shall be equally spaced and shall be separated by at least ¼ inch. Additional increments are optional. The audiogram pen tracings shall not exceed 2 dB in width.

(B) It shall be possible to set the stylus manually at the 10-dB increment lines for calibration purposes.

(C) The slewing rate for the audiometer attenuator shall not be more than 6 dB/sec except that an initial slewing rate greater than 6 dB/sec is permitted at the beginning of each new test frequency, but only until the second subject response.

(D) The audiometer shall remain at each required test frequency for 30 seconds (±3 seconds). The audiogram shall be clearly marked at each change of frequency and the actual frequency change of the audiometer shall not deviate from the frequency boundaries marked on the audiogram by more than ±3 seconds.

(E) It must be possible at each test frequency to place a horizontal line segment parallel to the time axis on the audiogram, such that the audiometric tracing crosses the line segment at least six times at that test frequency. At each test frequency the threshold shall be the average of the midpoints of the tracing excursions.

Appendix D: Audiometric Test Rooms

This Appendix is Mandatory

Rooms used for audiometric testing shall not have backgound sound pressure levels exceeding those in Table D-$_2$ when measured by equipment confoming at least to the Type 2 requirements of American National Standard Specification for Sound Level Meters, S1.4–1971 (R1976), and to the Class II requirements of American National Standard Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets, S1.11–1971 (R1976).

Table D-2.—*Maximum Allowable Octave-Band Sound Pressure Levels for Audiometric Test Rooms*

Octave-band center frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level (dB)	40	40	47	57	62

Appendix E: Acoustic Calibration of Audiometers

This Appendix is Mandatory

Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this Appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerances permitted by American Standard Specification for Audiometers, S3.6–1969.

(1) Sound Pressure Output Check

A. Place the earphone coupler over the microphone of the sound level meter and place the earphone on the coupler.

B. Set the audiometer's hearing threshold level (HTL) dial to 70 dB.

C. Measure the sound pressure level of the tones at each test frequency from 500 Hz through 6000 Hz for each earphone.

D. At each frequency the readout on the sound level meter should correspond to the levels in Table E–1 or Table E–2, as appropriate, for the type of earphone, in the column entitled "sound level meter reading."

(2) Linearity Check

A. With the earphone in place, set the frequency to 1000 Hz and the HTL dial on the audiometer to 70 dB.

B. Measure the sound levels in the coupler at each 10-dB decrement from 70 dB to 10 dB, noting the sound level meter reading at each setting.

C. For each 10-dB decrement on the audiometer the sound level meter should indicate a corresponding 10 dB decrease.

D. This measurement may be made electrically with a voltmeter connected to the earphone terminals.

(3) Tolerances

When any of the measured sound levels deviate from the levels in Table E–1 or Table E–2 by ±3 dB at any test frequency between 500 and 3000 Hz, 4 dB at 4000 Hz, or 5 dB at 6000 Hz, and exhaustive calibration is advised. An exhaustive calibration is required if the deviations are greater than 10 dB at any test frequency.

Table E-1.—*Reference Threshold Levels for Telephonics—TDH–39 Earphones*

Frequency, Hz	Reference threshold level for TDH–39 earphones, dB	Sound level meter reading, dB
500	11.5	81.5
1000	7	77
2000	9	79
3000	10	80
4000	9.5	79.5
6000	15.5	85.5

Table E-2.—*Reference Threshold Levels for Telephonics—TDH–49 Earphones*

Frequency, Hz	Reference threshold level for TDH–49 earphones, dB	Sound level meter reading, dB
500	13.5	83.5
1000	7.5	77.5
2000	11	81.0
3000	9.5	79.5
4000	10.5	80.5
6000	13.5	83.5

Appendix G: Methods for Estimating the Adequacy of Hearing Protector Attentuation

This Appendix is Mandatory

For employees who have experienced a significant threshold shift, hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dB. Employers must select one of the following methods by which to estimate the adequacy of hearing protector attenuation.

The most convenient method is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This Appendix describes four methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given exposure environment. Selection among the four procedures is dependent upon the employer's noise measuring instruments.

Instead of using the NRR, employers may evaluate the adequacy of hearing protector attenuation by using one of the three methods developed by the National Institute for Occupational Safety and Health (NIOSH), which are described in the "List of Personal Hearing Protectors and Attenuation Data," HEW Publication No. 76–120, 1975, pages 21–37. These methods are known as NIOSH methods #1, #2 and #3. The NRR described below is a simplification of NIOSH method #2. The most complex method is NIOSH method #1, which is probably the most accurate method since it uses the largest amount of spectral information from the individual employee's noise environment. As in the case of the NRR method described below, if one of the NIOSH methods is used, the selected method must be applied to an individual's noise environment to assess the adequacy of the attenuation. Employers should be careful to take a sufficent number of measurements in order to achieve a representative sample for each time segment.

Note.—The employer must remember that calculated attenuation values reflect realistic values only to the extent that the protectors are properly fitted and worn.

When using the NRR to assess hearing protector adequacy, one of the following methods must be used:

(i) When using a dosimeter that is capable of C-weighted measurements:

(A) Obtain the employee's C-weighted dose for the entire workshift, and convert to TWA (see Appendix A, II).

(B) Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(ii) When using a dosimeter that is not capable of C-weighted measurements, the following method may be used:

(A) Convert the A-weighted dose to TWA (see Appendix A).

(B) Subtract 7 dB from the NRR.

(C) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iii) When using a sound level meter set to the A-weighting network:

(A) Obtain the employee's A-weighted TWA.

(B) Subtract 7dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iv) When using a sound level meter set on the C-weighting network:

(A) Obtain a representative sample of the C-weighted sound levels in the employee's environment.

(C) Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.

Appendix H: Availability of Referenced Documents

Paragraphs (c) through (s) of 29 CFR 1910.95 and the accompanying appendices contain provisions which incorporate publications by reference. Generally, the publications provide criteria for instruments to be used in monitoring and audiometric testing. These criteria are intended to be mandatory when so indicated in the applicable paragraphs of Section 1910.95 and appendices.

It should be noted that OSHA does not require that employers purchase a copy of the referenced publications. Employers, however, may desire to obtain a copy of the referenced publications for their own information.

The designation of the paragraph of the standard in which the referenced publications appear, the titles of the publications, and the availability of the publications are as follows:

Paragraph designation	Referenced publication	Available from—
§ 1910.95(g)(1)(i)	"Specification for Personal Noise Dosimeters," ANSI S1.25–1978. (ASA 25–1978).	Back Numbers Department, Dept. STD, American Institute of Physics, 333 E. 45th St., New York, NY 10017. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.
§ 1910.95(g)(1)(ii)	"Specification for Sound Level Meters," S1.4–1971 (R1976).	American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.
§ 1910.95(k)(2), appendix E.	"Specifications for Audiometers," S3.6–1969.	American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.
Appendix D	"Specification for Octave, Half-Octave and Third-Octave Band Filter Sets," S1.11–1971 (R1976).	Back Numbers Department, Dept. STD, American Institute of Physics, 333 E. 45th St., New York, NY 10017; American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.
Appendix G	"List of Personal Hearing Protectors and Attenuation Data," HEW Pub. No. 76–120, 1975.	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The referenced publications (or a microfiche of the publications) are available for review at many universities and public libraries throughout the country. These publications may also be examined at the OSHA Technical Data Center, Room N2439, United States Department of Labor, 200 Constitution Avenue N.W., Washington, D.C. 20210, (202) 523–9700 or at any OSHA Regional Office (see telephone directories under United States Government—Labor Department).

Appendix I: Definitions

These definitions apply to the following terms as used in paragraphs (c) through (r) of 29 CFR 1910.95.

Audiogram—A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

Audiologist—A professional, specializing in the study and rehabilitation of hearing, who is certified by the American Speech, Hearing, and Language Association or licensed by a state board of examiners.

Baseline audiogram—The audiogram against which future audiograms are compared.

Crest factor—Absolute value of the ratio of the peak value and the root-mean-square value measured over a specified time interval where both values are measured in reference to the arithmetic mean value of the wave.

Criterion sound level—A sound level of 90 decibels.

Decibel (dB)—Unit of measurement of sound level.

Hertz (Hz)—Unit of measurement of frequency, numerically equal to cycles per second.

Medical pathology—A disorder or disease. For purposes of this regulation, a condition

or disease affecting the ear, which should be treated by a physician specialist.

Noise dose—The ratio, expressed as a percentage, of (1) the time integral, over a stated time or event, of the 0.6 power of the measured SLOW exponential time-averaged, squared A-weighted sound pressure and (2) the product of the criterion duration (8 hours) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).

Noise dosimeter—An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

Otolaryngologist—A physician specializing in diagnosis and treatment of disorders of the ear, nose and throat.

Representative exposure—Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employers deem to be representative of the exposures of other employees in the workplace.

Sound level—Ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: decibels (dB). For use with this regulation, SLOW time response, in accordance with ANSI S1.4–1971 (R1976), is required.

Sound level meter—An instrument for the measurement of sound level.

Time-weighted average sound level—That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

VII. Authority

This document was prepared under the direction of Thorne G. Auchter, Assistant Secretary of Labor for Occupational Safety and Health, 200 Constitution Avenue, N.W., Washington, D.C. 20210.

(Secs. 4, 6, 8, 84 Stat. 1592, 1593, 1599, [29 U.S.C. 653, 655, 657]; 5 U.S.C. 553; Secretary of Labor's Order No. 8–76 (41 FR 25059))

Signed at Washington, D.C. this 18th day of August, 1981.

Thorne G. Auchter,

Assistant Secretary of Labor.

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DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

Occupational Noise Exposure; Hearing Conservation Amendment

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Request for comments.

SUMMARY: In the Rules section of this issue, the Occupational Safety and Health Administration is publishing a document partially lifting an administrative stay of the hearing conservation amendment. As explained more fully in the Rules section document, certain provisions of the amendment are being reopened for comment and comments are also being requested on whether many of the provisions which have been reopened for comment should be stayed in the interim. Refer to this document for further details.

FOR FURTHER INFORMATION CONTACT: Dr. Alice Suter, Telephone (202) 523–7151.

Signed at Washington, D.C. this 18th day of August, 1981.

Thorne G. Auchter,

Assistant Secretary of Labor.

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